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The Past and Future

Earth

Investigating Ecosystems

PUBLIC DOCUMENTS
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JUN 29 1995

Hidden Data

Learning About Ecosystems from Archeological Sites

FRANCIS P. MCMANAMON

EFFECTIVE MANAGEMENT REQUIRES that the entity being managed is described, understood, and interpreted accurately. This is true for ecosystems as for anything else. The tendency these days, however, is to view ecosystems as purely "natural" phenomena. One has only to look at our most pristine wilderness areas to see the error in this assumption. There—and across the continent—archeological sites testify to the fact that human beings have been a "natural" part of their ecosystems for millennia.

From a management perspective, archeological sites and historic structures should be preserved if only because Americans have made it clear that they value their commemorative, associative, and interpretive qualities. But, beyond that, these cultural resources offer evidence of past environments that should be put to effective use in managing them in the future.

Archeological sites present a unique opportunity for managers to learn about the long-term functioning of ecosystems. The archeological record reveals how prehistoric human populations and their environments interacted over extended spans of time—with both changing as a result. At a minimum, these sites offer evidence about the evolution of a vast range of plant and animal species.

SCIENTISTS STUDYING ECOSYSTEMS would do well to start considering archeological sites as "scientific monitoring stations" put in place ages ago. These sites frequently contain preserved pollen, seeds, animal bones, wood samples, and other botanical or faunal remains that, upon excavation, immediately tell us about the nonhuman components of past ecosystems. With further examination and analysis in the lab, they can provide even more information.

In North America, human populations have been important actors in their ecosystems since reaching the continent at least 12,000 years ago. That means there is an enormous amount of data out there about our environment over a very long period of time. This information could potentially help us establish a baseline of ecosystems past to judge changes in ecosystems future.

Clearly, this data would be invaluable to managers. To maximize management effectiveness, however, all of an ecosystem's cultural resources would have to be adequately identified, described, evaluated, and interpreted.

In a March 1994 memorandum to senior managers in the Department of the Interior, Assistant Secretary Bonnie R. Cohen pointed out the importance of archeological and other cultural resources to ecosystem management. She highlighted their commemorative and interpretive value as well as their worth from the standpoint of understanding and monitoring the long-term changes in biological resources. Her main message to the senior managers, however, was that the ecosystem programs they were responsible for ought not have a blind spot where cultural resources should be, and that serious consequences could be expected if they did.

Cohen's concern—that the widespread development and implementation of ecosystem management by public agencies might ignore cultural resources—is well-founded. Most of the planning, development, and implementation of ecosystem management is being undertaken by natural resource scientists or managers whose background and focus is on the "natural" environment.

THIS PROBLEM IS being dealt with on a number of levels. A series of recent documents—from the NPS *Humanities and the National Parks* to the Society for American Archaeology's *Save the Past for the Future II*—call for cultural resource experts to be more involved in developing and implementing ecosystem management. The NPS draft paper "Ecosystem Management in the National Park Service" presents a well-integrated role for cultural resources in ecosystem management.

These documents and the Cohen memorandum reflect the commitment of senior administration officials and national organizations to include cultural resources in ecosystem management. Statements from these documents should be used at all levels of public agencies by individual archeologists, historians, curators, anthropologists, and other cultural resource specialists to inject their areas of expertise into individual ecosystem management programs or projects.

We need to work at all levels—as well as publicize our successes—to ensure that archeological and other cultural resources are not ignored in the development and implementation of this new, comprehensive approach to resource management.

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Cover: Bandelier National Monument, NM. By JOSEPH COURTNEY WHITE, FROM HIS BOOK *IN THE LAND OF THE DELIGHT MAKERS* (SALT LAKE CITY: UNIVERSITY OF UTAH PRESS, 1992).

PETER J. MEHRINGER, JR.

The light-colored layer in this research trench—ash from an eruption of Oregon's Mt. Mazama about 7,000 years ago—resides under strata showing that human occupation resumed within a few hundred years after the ash fall. Page 8.

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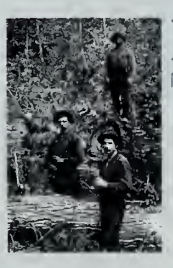

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News, Views, and Recently Noted

New Members Join Cultural Property Committee

President Clinton has named seven new members to the Cultural Property Advisory Committee. They were sworn in January 30 by U.S. Information Agency Director Joseph Duffey at the Old Executive Office Building in Washington, D.C.

The new appointees are Martin E. Sullivan of Phoenix (chairman); Miguel Angel Corzo of Los Angeles; Hester A. Davis of Fayetteville, Arkansas; Prudence M. Rice of Carbondale, Illinois; Gerald G. Stiebel of New York City; Eugene V. Thaw of Santa Fe; and Stephen E. Weil of Washington, D.C.

The committee was established by the Convention on Cultural Property Implementation Act of 1983. Under the act, the United States can ban the importation of certain artifacts to assist a country in protecting its cultural patrimony for scientific, cultural, and educational purposes. The committee reviews requests for aid from countries whose cultural treasures are being illegally removed and peddled in the illegal art market.

The committee has 11 members in all, each serving a three-year term. Law requires that two members represent the interests of museums, three specialize in archeology, anthropology, ethnology, or related disciplines, three are experts in the international sale of cultural property, and three represent the general public.

Ancients on the Airwaves

In the age of Sega Genesis, MTV, and virtual reality, does archeology stand a chance? Can a bookish pursuit compete for the attention of a nation of television-watchers? A trio of Michigan archeologists are so passionate about their line of work that they are willing to gamble that it can.

Realizing that TV is the medium of choice, Pedar Foss, Alan Hogg, and David West Reynolds took advantage of free training offered by the Community Television Network, Ann Arbor's local cable access station. Over six months, they familiarized themselves with the use of video and sound equipment. The result: "The Archaeologist," a half-hour documentary-style TV show.

"We want to reach as many people as possible," says Foss. "We are aiming for the 15 and older crowd, and our mission is strictly educational. We would be very pleased if we could do for archeology what James Burke [producer of acclaimed science shows shown on public T.V. in the 1970s] did for the history of science."

Foss says he couldn't think of anyone else who was taking this approach to bring archeology to the public. Reynolds, Hogg, and Foss believe that archeology on television, for the most part, has lacked authoritative and careful treatment of issues in which the public will have an interest.

Asked how their program differs from such shows as "Archaeology" on the Learning Channel, the producers say that in spite of the great disparity in production budgets (the first episode of "The Archaeologist" was made for $75), theirs will present the discipline in a light that is more substantive and critical. Other shows about archeology, they contend, have a tendency to extoll the "wonder" and "mystery" of times long past, but fall short in the analysis department.

The first episode deals with the evolution of the archeologist from antiquarian to scholar and scientist. The producers—classical archeologists by training (their second episode is about the Roman provinces)—aim to eventually turn to North America. Ideas for future shows include archeological ethics, conservation, and looting. Foss says that through "The Archaeologist," he and his partners hope to answer the question they know will be in the minds of viewers: "Why should I care about the past?"

The Community Television Network offers free training to anyone in exchange for first rights to air anything produced. "The Archaeologist" is comprised mostly of stills, with Reynolds as host. Interviews with other archeologists and some 1920s footage from the University of Michigan's Kelsey Museum have been used as well. The first episode was shot with SVHS, which, says Foss, yields a product that is "almost" broadcast quality. They have had some difficulty with sound, however. "We think we could produce a really good show if we had the right equipment," Foss says.

The producers hope, at some point, to have a professional production team as well as a budget to film overseas. If all goes well, "The Archaeologist" could find a home on PBS, cable, or the educational video market.

Contact Dr. Pedar Foss, 318 E. Jefferson #4, Ann Arbor, MI 48104, E-mail pfoss@umich.edu, or David West Reynolds, 1094 Island Drive Ct., #104, Ann Arbor, MI 48105.

Signature of the Past

JOSEPH BALACHOWSKI/HABS

BRUSH AGAINST the old stone structure, and you could take a piece out of it. Square Tower at Hovenweep National Monument, as dramatic a signature as any left by the ancient people of the desert, is giving way to time and nature. Sadly, it won't be with us forever.

Enter the Park Service Historic American Buildings Survey. In the summer of 1993, a HABS team converged on Hovenweep and Mesa Verde National Park, attaching paper bullseyes to the crumbling stonework. It was the first phase of a unique project to produce a permanent record of selected structures at the two parks.

Under the direction of HABS architect Joseph Balachowski, the team recorded Square Tower, Hovenweep Castle (above), Hovenweep House, and Mesa Verde's Balcony House, applying a technology never before used by the Park Service on an archeological site. With the bullseyes as data points, they circled the ruins, taking pictures with Linhoff Metrika 150mm and 90mm photogrammetric cameras. From these known points would grow a record of the structures as precise as an architect's drawing.

Past attempts to document such ruins have been generally accurate, but elevations, almost by necessity, were drawn with a good deal of artistic license. The highly irregular surfaces make conventional methods of measuring all but impossible. The craftsmen who built these structures lacked the engineering skills of the Mayans and Egyptians; corners are not particularly square, courses of stone not uniform. "They built the best they could, given their primitive tools and limited raw materials," says Balachowski. That's why photogrammetry is so essential to the project.

Last summer, measured drawings of the two sites were generated in the computer-aided drafting studio HABS shares with the Historic American Engineering Record. The photogrammetric images, stone by stone, were digitized into Autocad software to produce the elevations. Plans and sections were also drawn using computer aided drafting.

The data gathered from the ruins will help monitor changes in them over time. There is also the possibility of producing 3-d images and loading the data into a structural program capable of calculating stresses.

The HABS project, an encounter between two technologies across the abyss of time, is proof that progress is not always at the expense of the past.

Sitewatch

Protecting the Nation's Archeological Heritage

Petroglyph Looters Sentenced

On March 13, three Arizona residents who illegally removed and sold petroglyphs from a national forest were sentenced in the U.S. District Court for the district of Arizona. The three earlier had pled guilty to violating the Archaeological Resources Protection Act (ARPA; 16 U.S.C. 470ee).

In January 1994 Adam Bruce sold four petroglyphs from Kaibab National Forest to federal undercover agents. During conversations with the agents, Bruce admitted that he knew his actions were illegal. He also implicated his father, John Bruce, as the "mastermind" of their "business," which, in addition to the looting of archeological goods, also included natural resources violations on Forest Service lands, such as elk poaching and removing moss rock.

In February 1994, the younger Bruce removed five more petroglyphs from Kaibab with a backhoe provided by Becky Whitted. Whitted helped load the petroglyphs and transport them to Phoenix where, together with the elder Bruce, they sold them to undercover agents for $1,500.

The court sentenced Adam Bruce to seven months in prison and 36 months supervised release. John Bruce was given 36 months probation and Becky Whitted received 24 months probation. The three were also ordered to pay over $7,600 in restitution to the national forest. In addition, three pickup trucks used to commit the violations were forfeited to the United States.

Law enforcement personnel from the Forest Service, Bureau of Land Management, and Arizona Game and Fish Department cooperatively investigated the case. Paul Charlton, assistant U.S. Attorney for the district of Arizona, served as the lead prosecutor.

Little Big Horn Looter Sentenced, Another Arrested

Richard Maniscalco, who earlier this year pled guilty in federal court to ARPA and Native American Graves Protection and Repatriation Act violations stemming from thefts from the park, has been sentenced in federal magistrate's court in Alexandria, Virginia. He faces a $500 fine and a year's probation on the charge of selling artifacts, and a $1,500 fine and a year's probation on the charge of trafficking in Native American remains.

As a condition of his probation, Maniscalco must also reimburse the U.S. probation office for the expenses of administering his case (about $2,100) and pay the Park Service $1,500 for repatriating the remains to the Cheyenne nation.

Meanwhile, in a related case, Charles Snyder of Bowie, Maryland, has been indicted on three counts of attempting to sell artifacts taken from the battlefield and possession of stolen government property. Snyder purchased about 50 artifacts from Maniscalco that originated from the park, including a cavalry button and several fired bullets and casings. Both of the arrests stem from a BLM sting operation that snared George Scott—a former seasonal ranger (two seasons) at Little Bighorn and a local school teacher—who had taken many of the artifacts and sold them to Maniscalco. Although BLM investigators made the initial case, Maniscalco and Snyder were tracked down and arrested by NPS special agents.

Couple Admits Digging Civil War Site

On March 17, a Banco, Virginia, husband-wife team of looters was convicted of removing artifacts from the C & O National Historical Park in Maryland. Brian R. Bader, 37, and Christine A. Bader, 42, pled guilty before U.S. Magistrate Donald Beachley of one count each of violating ARPA. The Baders were sentenced on the same date.

In accordance with the provisions of a plea agreement, the Baders were fined $200 and placed on unsupervised probation. They were also ordered to pay $1,400 restitution to the National Park Service. The metal detectors and artifacts found in their possession were forfeited to the United States.

The Baders were discovered in November 1993 by ranger Michael Sabatini. In their possession were two metal detectors, two shovels, and numerous minnie balls, canister balls, and buttons. Investigators later found more than 24 newly dug holes in former Union Army fortifications located on park property.

A FUTURE in Need of a Past

Archealagical sites are lessans in haw peaple respand ta shifts in weather patterns, saurces af supply far raw materials, and sacial structure. It's na wander that the Natianal Science and Technalagy Cauncil identifies them as essential ta managing the natian's resaurces fallawing ecalagical principles. The challenge naw is ta cammunicate these lessans. As the articles in this issue illustrate, many disciplines—warking hand in hand with archealagy—are being called an ta da just that.

Archealagy has a traditian af warking with researchers fram different fields. In the 1930s, the excavatian af the Clavis site in New Mexica's Blackwater Draw integrated studies af stratigraphy, pallen, and paleantalagy ta characterize 11,000-year-ald faad supplies and hunting patterns.

This appraach makes eminent sense as we seek ta manage aur dwindling resaurces. Allied with ather fields, archealagy can tell us much about what resaurces were available in the past, wha used them, and how that changed enviranment and culture alike.

Federal archealagical projects such as the respanse ta the *Exxon Valdez* ail spill demanstrate the value af such an interdisciplinary appraach. There needs ta be mare such callabaratian, bath ta imprave the projects and sharpen the lessans they yield.

Abave: Bandelier Natianal Manument, NM. JOSEPH COURTNEY WHITE, FROM HIS BOOK *IN THE LAND OF THE DELIGHT MAKERS* (SALT LAKE CITY: UNIVERSITY OF UTAH PRESS, 1992).

People and Ecosystems

The Archeology of Ecology

Taking the Long View

William D. Lipe

Right: The light gray strata in the trench face at Mazama Restoration Dunes site, Fort Rock Basin, OR, is ash from an eruption of Mt. Mazama (now Crater Lake) about 7,000 years ago (Mehringer and Cannon 1994).

Actors on an Ancient Stage

PETER J. MEHRINGER, JR.

1995, Ingersoll 1994). Such ideas may implicitly underlie the tendency of some to minimize the long-term human contributions to the evolution of ecosystems.

These views cannot assist in either understanding or managing ecosystems. To manage an ecosystem is to make choices about human needs and impacts with the goal of sustaining its diversity and productivity (BLM 1994). As our ability to effect change increases, the natural ecosystem will become ever more modified and, in some cases, constructed, by human agency. Therefore, the "dual narrative" (BLM 1994) must be employed to understand the human side of the equation as well as the strictly biological and physical.

People did not wait for the Industrial Revolution or European colonization to become agents of change in their environment. History and archeology show that human beings have shaped the

ecosystems of North America for at least 12,000 years, and those of Africa, Europe, and Asia for much longer.

Even if people could be written out of the equation, "restoring" ecosystems to some static "original" condition is not a scientifically meaningful goal. Ecosystems are by nature dynamic: witness the competition among plants and animals, the weather, and erosion—not to mention volcanic eruptions, forest fires, and hurricanes (Oliver 1994, Winterhalder 1994, Barker 1995). Clearly, this evidence of past variability should inform the decisions we make about the future (Everett et al. 1993).

Where Does Archeology Fit In?

The ethic underlying ecosystem management finds a close parallel in conservation archeology, which considers archeological sites to be non-renewable resources valuable to society. Like natural resources, they require stewardship and management for future generations.

Conservation archeology is use-oriented in the sense that it justifies protecting and managing sites because of the values that society can obtain from them (Lipe 1984). By providing information about past cultures and environments, these sites can help inform both researchers and the public. Archeological sites and artifacts can also stand as symbols of particular histories or beliefs—for example, as national historic landmarks or as what have come to be called traditional cultural properties.

Because these resources are non-renewable, it is fortunate that many such uses have little or no effect on their physical integrity. The educational or symbolic value of Mesa Verde's Cliff Palace can be obtained by merely viewing it. With proper precautions, continued viewing does not erode the fabric of the site. However, if excavation is undertaken to provide new information, the site will be physically changed, and the same excavation cannot be repeated.

Conservation archeology promotes frugality in consumptive uses such as excavation, but recognizes that providing new information is a primary social benefit of archeology, and hence must be a primary goal of resource management. That is, archeological resources must be protected and managed *so that* they can provide an optimal yield of information and other public benefits over the long term (Lipe 1974, 1985).

A continuing flow of information from research is also seen as essential to effective public interpretation and education, whether on site or in the museum, the classroom, or the media. Conservation archeology also recognizes the need to protect and manage archeological resources with symbolic value for specific cultural groups as well as the broader public (Parker and King 1992).

Because the primary threats to archeological resources come not from research or other public uses, but from development, looting, vandalism, and the forces of nature, conservation archeologists invest much effort in promoting protective legislation, educating the public, and involving the discipline early in the planning of construction projects.

In short, the goals of conservation archeology dovetail quite well with those of ecosystem management, provided that land managers acknowledge the importance of archeological resources. Clearly, ecosystem management's focus on integrated, future-oriented goals—and on regional landscapes—is much more compatible with conservation archeology than fragmented resource-by-resource land management approaches, or those based on arbitrarily defined management units. Linked with paleoenvironmental studies, archeology can offer much to ecosystem management, and to public education as well.

Smarter Ways to Manage the Planet

Archeology can contribute to "smarter" ecosystem management in a number of ways. Most directly, archeology can provide time depth to our understanding of how the cultural, biological, and physical components of ecosystems interact. To understand and control the many aspects of ecosystems, land managers must first acknowledge they are not static. Then they need to learn more about their history and variation (Everett et al. 1993, Johnson et al. 1994).

It is also essential that land managers not assume that the 19th century state of an ecosystem represents its "natural" or "pristine" expression. For example, some major studies of Pacific ecology assume that human beings had little effect on the distribution of species until the 19th or 20th centuries. Steadman (1995) shows otherwise. Using archeological data, he illustrates that a thousand or more years ago, the settlement of various Pacific islands was followed by the rapid extinction of hundreds of bird species.

Archeological sites, and their patterns of distribution on the landscape, provide a potentially immense reservoir of information for understanding, and ultimately managing, ecosystems. Archeological evidence can work hand in hand with historic documents and photographs as well as with oral history. Archeology can also complement data drawn from non-cultural sources, such as bogs, ponds, alluvial sediments, packrat middens, old-growth woodlands, and so forth.

Kenneth Petersen (1988), for example, used pollen records from mountain ponds and tree-ring records from high altitude conifers to reconstruct the variations in climate that affected the Pueblo Indian agriculture and settlement of southwestern Colorado in the 600s through 1200s A.D. This work contributed greatly to interpreting data from the Dolores Archeological Project, a large study funded by the Bureau of Reclamation in conjunction with the construction of the McPhee Reservoir.

Likewise, pollen and charcoal extracted from the sediment of ponds and bogs in the northwest has enabled researchers (for example, Mehringer 1985 and Mehringer and Wigand 1987 and 1990) to reconstruct a long, detailed history of changes in vegetation and the frequency of fires (Johnson et al. 1994). From this record, climatic and ecological change can be inferred, and in some cases, so can the use of fire by Native Americans to manage vegetation and game over large areas (for example, Barrett and Arno 1982).

Archeologists and paleoenvironmental scientists need to understand the information needs of land and resource managers and work cooperatively to meet them. The pioneering Eastside Forest Ecosystem Health Assessment (Everett et al. 1993, Everett 1994) provides a model for this kind of cooperation. In one of the studies done as part of the assessment, Johnson et al. (1994) note:

> By studying today's communities, without reference to the fossil record, we could not have known that the eastside's familiar

PETER J. MEHRINGER, JR.

Work at Fort Rock Basin has provided a detailed record of environmental and cultural change over the last 11,000 years (Mehringer and Cannon 1994).

broad distributions of woodland and steppe did not take shape until after 4,000 B.P. [before present], that northern Idaho's hemlock and cedar forests were even younger, or that a few centuries ago and many times during the past 4,000 years, the juniper woodland's expanse exceeded that of its historic spread. The remarkably rapid demise of the scabland's late-glacial woodlands shows the process and pace of total replacement, and the potential magnitude of future vegetation change with rapid global warming of 4 to 5° C [Overpeck et al. 1991].

A shift to ecosystems as management units should in most cases provide better contexts for managing archeological and paleoenvironmental resources than do the administratively drawn units currently in use. Many archeological resource managers have in fact long attempted to use regional or ecosystem contexts in making decisions. Still, one of the problems in complying with the section 106 dictates of the National Historic Preservation Act is overreliance on a site-by-site approach (King 1995). An ecosystem orientation should make it easier to develop larger-scale contexts for assessing archeological and historic sites, and may help justify greater protection for paleoenvironmental sites as well.

As the new orientation takes effect, archeologists will have to make themselves more useful to ecosystem managers. This may mean that some of the archeological resource will have to be consumed in excavations focused on the ecology of the past. Archeologists will also be called upon to work even more closely with paleoenvironmental scientists. Such research can be undertaken under section 106 of the National Historic Preservation Act as part of an agency's response to development. Or agencies can proactively pursue this work under other authorities such as section 110 of the Historic Preservation Act. Investigations by non-federal researchers can be integrated into the research through cooperative agreements or special contracts.

Archeology's Main Message

The success of ecosystem management will ultimately depend on the ability of resource and land managers to obtain wide public support. Archeology can be a particularly useful tool in educating the public, and hence can help bring about better understanding of the concepts of ecosystem management.

The archeological record is rich with examples of stable long-term adaptations of humans to their environments, as well as of significant ecological changes brought about by small-scale, low-technology, prehistoric cultures (Kohler 1994). Of course, the archeology of the historic period documents the rapid environmental changes of the Anglo-European frontier and the Industrial Revolution.

PETER J. MEHRINGER, JR.

A 6,650-year-old hearth yielded the remains of waterfowl and fish at the Mazama Dunes, recently acquired by the Archaeological Conservancy. The work was a cooperative effort between BLM archeologist William Cannon and Peter J. Mehringer of Washington State University.

Marquardt (1994), for example, reports on how a large number of volunteers assisting with research on Florida's prehistoric Calusa Indian culture learned about the environment as well as archeology. He notes, "The story of the Calusa is also the story of the Charlotte Harbor estuarine system, a marvelously productive, shallow, grassy estuary fed by three major rivers and surrounded by geologically young barrier islands. We teach both adults and children about the mangrove detritus food chain. As we dig and process artifacts, and when we give public talks, we draw connections between the quality of life for humans and animals and the quality of the water, land, and air."

As Marquardt shows, linking ecosystem concepts with archeology may have a synergistic effect, promoting wider public understanding of both.

The most important message that archeology can communicate in its uniquely tangible and dramatic way is emphasized in a recent book by Jared Diamond (1992). Diamond argues that because our cultures and technologies allow us to switch rapidly to new resources as old ones are depleted, we have an enormous capacity to degrade the ecosystems on which we depend. Archeology can dramatize this by showing that the capacity is an ancient one, and hence part of the human condition.

In a chapter entitled "The Golden Age That Never Was," Diamond summarizes a number of cases of habitat destruction predating the industrial era. In concluding the chapter, he says that "archeological research is one of the best bargains available to government planners . . . We can't afford the experiment of developing five counties in five different ways and seeing which four counties get ruined. Instead, it will cost us much less in the long run if we hire archeologists to find out what happened the last time."

Diamond argues that our ability to degrade environments poses as great a threat to the future as our susceptibility to letting intergroup conflict escalate to violence. Both threats will require constant vigilance if we are to maintain a decent quality of life for the generations to come.

The educational potential of archeology can be realized by on-site interpretation, museum exhibits, research involving adults and students, school programs, and both print and visual media. The increasing success of all these modes evidences a growing public receptivity to archeology as a way of learning about cultures and environments. For example, the newsletter of the Society for American Archaeology's public education committee has attained a circulation of nearly 9,000 in less than five years, with a large number of copies going to teachers in the K-12 school system.

Land managers must not fall into the trap of justifying the protection and management of archeological sites only to the extent that they contribute to ecosystem-oriented research and education. Sites and artifacts document human history, whether or not

they also contribute to a better understanding of past cultural ecology; these historical uses have long been recognized by federal law and policy. Furthermore, many Native American and other groups see some archeological sites as tangible expressions of their cultural traditions. Their claims as stakeholders in management decisions affecting these sites are being increasingly established by law, policy, and public opinion.

If these broader concerns are taken into account, ecosystem management appears to be substantially more compatible with conservation archeology than are existing land and resource management frameworks.

William D. Lipe is president of the Society for American Archaeology. For more information, he can be contacted at the Department of Anthropology, Washington State University, Pullman, WA 99164-4910, (509) 335-2100, fax (509) 335-3999.

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FROM the TOP

By Michael Kunz and Robert King

More than 10,000 years ago, on a remote hilltop 150 miles above the Arctic Circle, ancient hunters waited for the mammoth, bison, and antelope that came to graze on the grasslands below. Then, abruptly, their world changed forever. The temperature went up, the grasses died out,

and hunter and hunted alike struggled to survive in a devastated environment. That's the scenario that seems to be emerging from Alaska's Mesa site, which made national headlines two years ago. Archeologists Michael Kunz and Robert King discuss their investigation's importance to studies of current global warming.

THE MESA, as the plateau is now known, rises 200 feet above a roadless expanse of tundra the size of Indiana, accessible only by helicopter. During the field season, the flights are frequent. The Mesa site is yielding evidence with potential far-reaching implications for the planet's future.

The story of the site began in the mid-1970s, when the Interior Department was charged with managing oil and gas exploration in the National Petroleum Reserve on the north slope of Alaska's

Above: Archeologists Richard Reanier and Sergei Slobodin with Michael Kunz, the Mesa looming in the background; Right: The Mesa's igneous rock—which resists weathering—contributes to its longevity.

Of the Planet

Above and right: Archeologists atop the Mesa.

Brooks Range, a barren chain of jagged peaks 500 miles north of Anchorage. In 1978, archeologists with the Bureau of Land Management, surveying the Mesa and its environs in advance of drilling, discovered stone projectile points that bore a striking resemblance to Paleoindian-style points of the American high plains and southwest.

"Paleoindians," the name given to the first Americans, occupied North America during the Pleistocene-Holocene transition, a period of extensive climate change 12,500 to 8,500 years ago. Before the discovery of the Mesa site, no scientifically accepted Paleoindian sites had been discovered in the Arctic, much less near the Bering land bridge.

The BLM archeologists excavated the remains of three ancient campfires at the Mesa; each contained chipping waste, stone tools, and at least one projectile point. None of the hearths had the minimum amount of charcoal required for radiocarbon dating, so their charcoal was combined, yielding a date of 7,620 B.P. (years before present)—about 1,000 years too recent to be considered "Paleoindian."

Jump forward a decade to 1989, when accelerator mass spectrometry, a new radiocarbon dating technique that can be used on very small amounts of organic material, became commercially available. Tested with the new method, the Mesa charcoal yielded a date of 9,730 B.P. Since then, charcoal from 14 Mesa hearths has yielded dates ranging from 11,660 to 9,730 B.P. In 1992 the uncertainty concerning the validity of the site's original date was resolved when the first sample was re-tested and dated to 10,060 B.P.

The Mesa is by most standards an archeologist's dream. Unlike most Arctic sites, it is basically uncontaminated by the remains of more recent cultures. The Mesa itself has been mostly undisturbed by the harsh Arctic environment, making excavation and analysis relatively uncomplicated. The site is exceptionally well dated and its distinctive projectile points now serve to indicate the presence of Paleoindians when found at other Alaskan sites. Because of these attributes, the Mesa has played a paramount role in defining the Northern Paleoindian Tradition.

However, because the site was only a hunting lookout, not a settlement, it has produced no plant or animal remains, which could supply information about the climate and environment during the time the site was occupied. These kinds of remains—which provide insights into residents' daily and seasonal activities—are usually found at encampments or where game was killed and butchered. Doubtless these activities were associated with the Mesa; however, they likely were confined to the valley floor and thus their remains may have been either eroded or buried by the meanderings and fluctuations of Iteriak Creek.

Research elsewhere in the world indicates that the Mesa was occupied during a time of radical global change. However, it

requires data from non-archeological contexts to understand how people using the Mesa were affected by the rapidly changing ecosystem.

Late Pleistocene fossil remains—including those of mammoth, bison, and antelope—are found throughout the region, demonstrating that until about 11,000 years ago the ecology of northern Alaska was quite different than it is today. Many of these extinct animals, grass-eaters with small hooves adapted for travel across firm, dry ground, were not well suited to digging through more than a thin snow cover for food. Their presence suggests a grassland ecosystem, best termed a steppe-tundra.

Preliminary research suggests that this ecosystem had a climate that was windier, colder, and drier than today. Braided streams probably served as sources of sand and loess, which the wind transported across the region. Unstable soils, the result of the wind-born sediment and minimal precipitation, prevented the accumulation of peat, probably keeping the summer-thaw layer in the soil thick, encouraging the growth of grasses.

Shortly after the Mesa was first occupied, the climate changed to much like that of today. The change was abrupt and rapid, probably too fast for the plantlife to adapt. It became warmer and wetter, with more snow in winter and more rain in summer. A resulting increase in vegetation probably restricted sediment runoff into streams, dampened flood events, and stabilized channels, fostering a switch from braided to predominantly meandering channels. This change removed sources of wind-born sediments and lessened disturbance to the surface of the land.

Together, the wetter climate, the stabilization of the floodplain, and the drop in wind-born sediments permitted a build-up of peat. Samples collected by coring through the modern tundra around the Mesa suggest that peat accumulation was region-wide by 8,500 B.P., with the vegetation much like it is today.

As peat accumulated, the seasonal frost-free layers shrank, causing soil temperatures to drop and surface water to pond. This further encouraged peat accumulation, squeezing out the grasslands so that the vegetation could sustain only specially adapted broad-hoofed herbivores, such as moose, caribou, and muskox.

These changes probably devastated the large Ice Age herbivores and may have severely impacted humans as well. The changed ecosystem made overland travel difficult, as anyone who has hiked across the tussock-tundra can attest. Decreased mobility reduced the size of an area that could be depended on for subsistence at the very time when the ability to range over a large area was necessary, given the dwindling of game. Such circumstances may have provided the impetus for some of the people to move south.

Paleoecological research associated with the Mesa has led to some interesting new discoveries. There is tentative evidence for a Younger Dryas (YD) event—a time of radical and rapid climate fluctuations at the core of the changes just described—in Alaska from 11,000 to 10,000 B.P.

The Mesa project has dated defined stratigraphic profiles using accelerator mass spectrometry, which has yielded evidence supporting the occurrence of the YD in Alaska. Several stratigraphic sections indicate that prior to 11,000 B.P. the climate had moderated to the extent that peat build-up had begun in favorable locales. Sometime between then and 9,500 B.P. the peat was overrun by solifluction, the thawed layer sliding downhill along the surface of the permafrost. This episode may represent a return to a full glacial climate, the YD, conducive to the spread of solifluction lobes.

One of the most exciting aspects of the paleoecological research is the discovery of the "Lake of the Pleistocene." Several hundred years ago, an ancient lake was breached and drained by a course change in the Nigu River 15 miles to the west of the Mesa. The lake's sedimentary record begins during full glacial times, spans the Pleistocene-Holocene transition, and extends up to the time of drainage. The frozen sediments of the drained lake are now exposed in a 150-meter-long, 5-meter-high cutbank of the river. The Pleistocene-Holocene transition is recorded by a stratigraphy change from sand to silt sediments. The lake sediments are finely laminated and contain a frozen archive of plant fossils. Because the lake cross-section is so large, study is not limited to core drilling as it would be if the lake had not been drained. This means that an immense amount of ancient information can be recovered.

This project promises to lead to new discoveries about the origins of the tussock-tundra ecosystem that blankets most of arctic Alaska, Canada, and Russia, which may play a key role in global budgets of carbon dioxide in the future. If the earth's climate warms up, vast amounts of peat may deteriorate, releasing large amounts of carbon dioxide into the atmosphere and increasing the greenhouse effect. This would feed a cycle of further peat deterioration, carbon dioxide release, and increasing global warming.

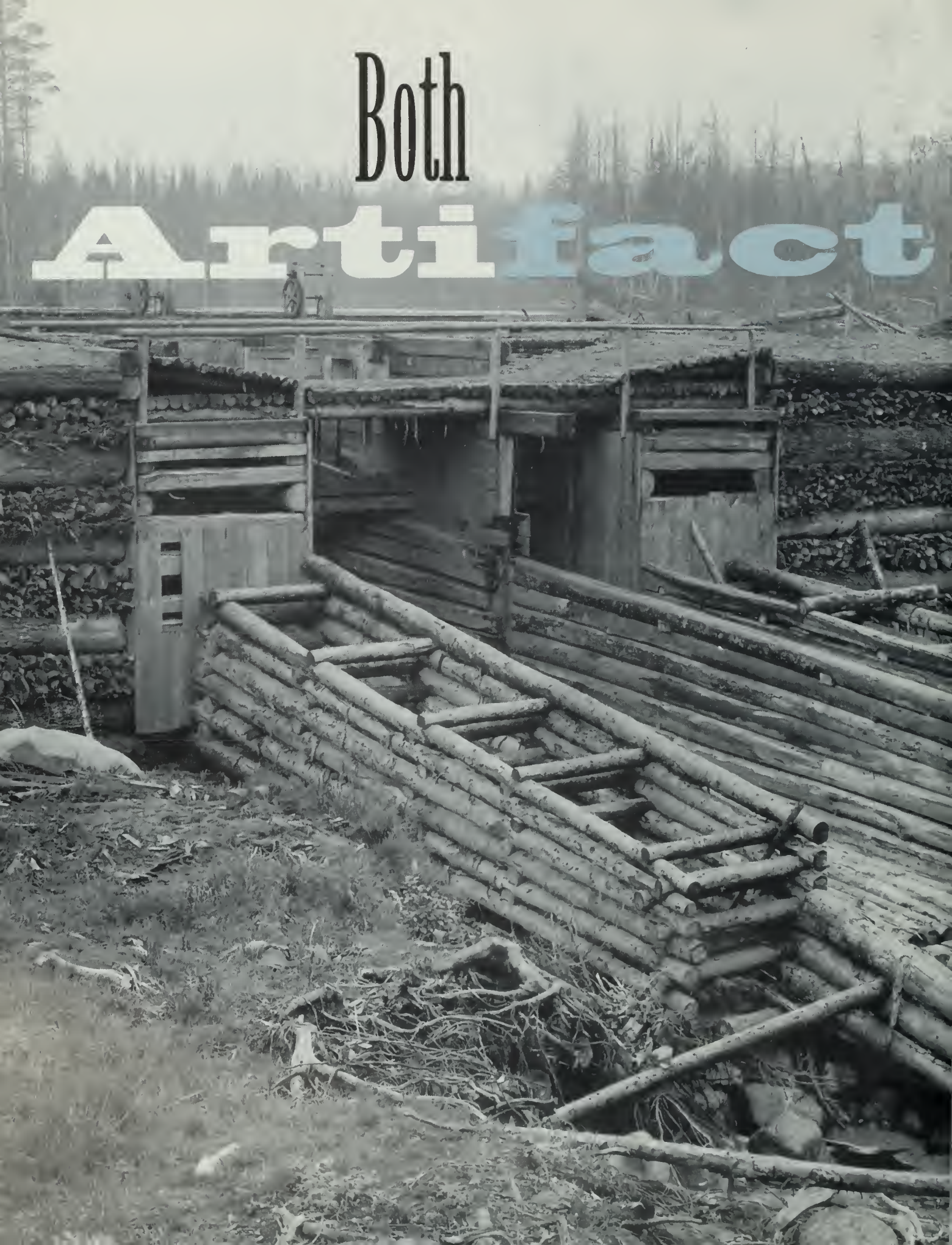
Studies of the Pleistocene-Holocene transition could provide valuable data for the critical debate over climate change. The effect of ancient warming episodes on permafrost may parallel what some scientists foresee as the result of global warming in the next century. Thus, the Mesa project can help identify processes and rates of change in Arctic ecosystems.

It is both fitting and ironic that research on the Mesa people, whose world changed so dramatically over 10,000 years ago, may help us deal with changes occurring to the Arctic ecosystem in our near future. To ignore this largely untapped source of information could eventually place us in the same category as the fauna of the late Ice Age.

For more information, contact Michael Kunz, BLM Arctic District, 1150 University Ave., Fairbanks, AK 99709-3844, (907) 474-2311, fax (907) 474-2280 or Robert King, BLM Alaska State Office (930), 222 West 7th Ave., #13, Anchorage, AK 99513-7599, (907) 271-5510.

Both

Artifact



and Habitat

The Nature of Our National Forests

As the Forest Service strives to sustain the nation's woodlands, archeologists are emerging as major players—and showing their worth in restoring rivers and protecting endangered species.

The public has spoken: save our forests for future generations. At the U.S. Forest Service, that means taking a more holistic view of America's woodlands—their past as well as their present. Enter archeology.

The Forest Service eastern region is using archeology as part of a larger plan that recognizes the complexity and interconnections of *all* the resources in the national forests. This strategy encourages collaborations among biologists, silviculturists, and archeologists, who in the past may have focused only on their own discipline.

With this initiative, archeologists not only reconstruct and interpret how people shaped past ecosystems, but also look at how this information can help restore and sustain them in the future. Although this applied approach is not new to the discipline, it is quite an innovation at the Forest Service. Traditionally, the archeologist's job was to ensure that projects that could potentially destroy sites, such as road building, followed the myriad federal preservation laws and regulations passed to protect them. The new approach, however, integrates archeology and

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The Indian method of preserving white fish for winter use in Minnesota. Picture taken by E.S. Bruce, 1902, Chippewa National Forest.

other heritage programs directly into land and resource management. No longer are they seen as encumbrances, put there only to ensure compliance with the law, but as an integral part of projects.

The initiative provides the opportunity to search out the non-anthropological uses of archeological data, applying the principles of the discipline to purposes that are neither pure research nor compliance-oriented. The basic premise is that the archeological record, by offering evidence of what people did in the past, can benefit other areas of science—as well as help resolve land and resource issues. Even if the original composition of a forest is long gone, archeologists can often detect evidence of it in the sites and artifacts that remain.

A major objective of this initiative is to promote a closer working relationship between natural resource specialists and archeologists, historians, ethnographers, and related professionals, who sometimes hold the key to reproducing, restoring, and sustaining the ecological conditions of the past. Many land managers, ecologists, and biological scientists—discounting the fact that people have shaped ecosystems for millennia—imagine they are working with pristine environments untouched by the human hand. In fact, forests are both artifact and habitat.

Several projects are underway that should prove instructive for managing environments in the future.

Studies of early logging—of its methods, techniques, and associated archeological features—have been useful in determining the industry's impact on terrestrial as well as aquatic environments. At northwestern Pennsylvania's Allegheny National Forest, biologists, silviculturists, foresters, and botanists are looking to archeologists and related professionals to study the effect of the turn-of-the-century railroad era on today's forest cover. Archeologists are examining vegetational change and ecosystem response over the last century, which—together with historic documents—suggest that the modern forest's roots are inter-

ARCHEOLOGY AND THE ENVIRONMENT

Northern Michigan's Hiawatha National Forest has hosted two studies demonstrating the worth of archeology in understanding and managing resources using ecological principles.

One investigated the influence of turn-of-the-century logging on fish habitats (see pictures opening this article). The archeological work will inform a river management plan whose goal is to improve stream channels, stabilize shorelines, identify significant sources of sedimentation, and generally restore a naturally dynamic river system.

A related investigation unearthed definitive proof that the river was once an important habitat for the lake sturgeon. Archeologists excavating a Native American site adjacent to the river discovered a relative abundance of sturgeon remains, confirming the significance of this threatened species to the river's health.

twined with the era's timber harvesting practices, rail logging lines, and wood chemical factories. Such studies are proving their worth as well when it comes to restoring lost landscapes.

Zooarcheology has played a role in restoring and protecting threatened, endangered, and sensitive species. The archeological record yields information on the evolution of species, including their past abundance, relationship with sources of food, competition with other animals, and the effects of changes in climate and water temperature. "Eco-archeological" analysis of plant remains is also useful to wildlife biologists tracking changes in habitats and species diversity.

Hydrologists and fisheries biologists are using archeological evidence in restoring streams and reintroducing species. The recovery of fish remains from archeological contexts is proving invaluable in analyzing past fish distributions, species displacement, catastrophic events, and—in conjunction with knowledge of current natural events—are helping explain long- and short-term trends.

At Horseshoe Bay in northern Minnesota's Chippewa National Forest, archeologists have analyzed approximately 200,000 fish bones, otoliths, and scales recovered from trading post structures dating from 1820 to 1860. These data, coupled with information from trader's journals and historic documents, provide a vivid picture of the abundance and diversity of species before the arrival of the fish harvesting industry. Fisheries biologists and archeologists are comparing this information with survey data from the modern era—1950 to 1990—to draft a plan for managing the region's current aquatic resources.

Cultural and archeological remains are more than the evidence people left on a landscape. They are the expressions of their interaction with that landscape. A historical record, if you will, of the dynamic and complex nature of ecosystems.

The Forest Service, by teaming its specialists in natural and cultural programs, recognizes that fact. It is a strategy that should serve the agency well in managing the nation's forests now and into the future.

For more information, contact Sandra Jo Forney, Regional Archeologist, U.S. Forest Service, Eastern Region, 310 W. Wisconsin Avenue, Milwaukee, WI 53203, (414) 297-3656.

A Cautionary Tale

By Roger G. Kennedy

As you might expect from a historian, I believe that a much improved program in the teaching of history and archeology will reinforce a stronger land ethic, as aspects of a wilderness program. Why? Because there is real history to be taught, to overcome fake history and pernicious myth. Wilderness is not, historically, what is left over in American history. It is not and never was empty. History, real history, rebuts the oafish assertion that this is or was an "empty continent" into which Europeans came, and over which their "pioneers" established mastery.

That version of our history is not only illiterate, it is pernicious. An "empty continent" ripe for mastery? The American continent was not empty in 1492; it was full of humans, seven million of them north of the Rio Grande. Even those places that did not contain houses or farms had a history.

Obviously, humans have been present at one time or another in all the areas we now call wilderness. Wilderness is full of the evidence of past life. Anyone who has seen the grave goods of the Hopewell Indians of Ohio knows that there among them are sculptures made from obsidian from what is now Yellowstone National Park. Anyone who has examined the sculpture of the Poverty Point people of northeast Louisiana knows that while Rome was a village, and Stonehenge was under construction, the Louisianans were collecting steatite and jasper from mountain places north and east of them which are now wilderness. And, in Maine, the Abenaki knew the Allagash very well.

National Park Service Director Kennedy and friends near the Raffman Site, northeastern Louisiana, November 1994: NPS is investigating the Mississippi Delta's Native American monumental earthen architecture to improve its preservation, protection, and interpretation. Pictured (l. to r.): Chip Jenkins (NPS), Ken P'Pool (deputy SHPO, Mississippi), representative of site owner, Kennedy, Bob Baker (NPS regional director, southeast), Jon Gibson (professor, Southwest Louisiana State University). FRANCIS P. MCMANAMON

My point is that we need pretend no longer that the Europeans and Africans found here an empty continent—seven million inhabitants north of the Rio Grande! People who had been exchanging things and traveling for millennia for thousands of miles, across all the great mountain ranges, along all the great rivers, for thousands of years.

The history of this continent is more intense and of a sharper contour when seen from wilderness—from places in which we intend that there will no longer be permanent human habitation. If we know anything about the history of this continent, we know that, several times before, great empty places have opened, though not by intention. They have opened because humans did not maintain an adequately respectful balance with their environment. In the central Mississippi Valley, from the 13th through the 15th centuries, well before the onset of European and African explorers and diseases, there appeared what archaeologists call "the Vacant Quarter." It was not a place deliberately set free of human occupation. It was a place which could no longer be occupied by humans. The great metropolis now lying in ruins beneath modern St. Louis and Cahokia had held, during the preceding centuries, more humans than Rome or London. And in 1400, it was empty.

The lesson was that humans had exhausted the capacity of that land to support them, and had contaminated it with their waste.

This is a cautionary tale. Wilderness is more than a cautionary tale; it is a cautionary place, an admonition to treat all the created world with respect. All that world. All its creatures, and all things great and small. Not just our fellow humans.

Roger G. Kennedy is director of the National Park Service. Excerpted from remarks before the 6th National Wilderness Conference, November 14-18, 1994, Santa Fe.

Locking HORNS With History

By Joseph Flanagan

IN THE WINTER OF 1925, a truck rumbled along the outskirts of the Olympic Peninsula's mountainous interior. In its bed were four shaggy passengers. The landscape that passed before them, high, clear, and rugged, was the quintessence of the Pacific Northwest.

And yet it was very different from the Cascade Mountains to the east and British Columbia to the north. In its delicate subalpine communities were species found nowhere else. There was Olympic Mountain milkvetch, Piper's bellflower, and Flett's violet. Isolated by lifeless miles of ice during glacial times, the peninsula became an island of living things, a kind of germ plasm where species differentiated into subspecies or entirely new ones. Its insular quality would endure long after the ice retreated.

The truck drivers were probably not concerned about biogeography. What had brought them on this mission was hunting, and their riders, *Oreamnos americanus*—mountain goats—were meant to seed a population of game animals. At Lake Crescent, the truck stopped, the tailgate was opened, and the goats ambled off. It was the first of several releases into what years later would become Olympic National Park.

Left: Goat captured in Alaska for introduction to Olympic National Park, 1927. Right: Wallowing, or dust bathing, can damage rare and endangered plants.
OLYMPIC NATIONAL PARK

The animals multiplied and prospered. By 1983 their descendants numbered around 1,180, and it was becoming apparent that all was not well.

While images of a solitary animal on a snowy peak may appeal to fond notions of the American wilderness, the goats have altered the fragile environment around them. Their grazing, trampling, and wallowing have damaged a number of plant species, raising the question of whether some of the rarer ones will survive. The Washington Natural Heritage Program lists 106 rare plants on the peninsula; 33 are in places where goats graze. One, the Olympic Mountain milkvetch, a prime candidate for the federal endangered species list, is found nowhere else in the world.

As NPS rangers experimented with various methods of controlling the goats, the animals got their own nomination for the endangered list, of a sort. A 1988 article by University of Missouri anthropologist Randall Lee Lyman suggested that the goats may have been indigenous to the peninsula in prehistoric times. Enter the Fund for Animals, mix in a swell of public interest, and soon a bona fide controversy was brewing.

Could anyone be sure that the goats weren't original inhabitants? After all, they were native to the nearby Cascades and British Columbia. How to account for the reported sightings by a

Spanish expedition in 1792? And what about the 19th century ethnographers who noted the use of goat wool by Indians? On top of that, an 1889 press expedition included goats in a list of regional fauna, and explorer Samuel Gilman reported a sighting in an 1896 *National Geographic* account (oft-cited later as evidence).

Meanwhile, as the Park Service considered shooting the goats from helicopters with high-powered rifles (the safest alternative for the humans involved), a group of archeologists, ethnographers, historians, and biogeographers undertook an effort to research the history of goats in the region. The goal: to find out whether the goats were native to the Olympic ecosystem. Ultimately, the research was compiled in three reports, which—along with the Lyman paper and the historical accounts—were reviewed by nine independent experts. The DOI's departmental consulting archeologist supported and participated in this process of peer review.

In one report, biologists Douglas B. Houston and Edward G. Schreiner document how the 10,000-year isolation of the peninsula led to the formation of habitat islands," which account for the relative dissimilarity of species between the Olympics and the nearby Cascades. For a long time, the Olympics, along with the Alexander and Queen Charlotte archipelagos, were the only habitable areas jutting above the glacial ice. The isolation made for a unique "species signature" that survives to the present day.

Could Spanish explorers have seen the goats from a ship in the Strait of Juan de Fuca, or from the lowlands near Dungeness? Olympic National Park historian Susan Schultz doesn't think so, even though their journals describe "buffalo . . . wild goats [and] leopards" feeding in "luxuriant pastures."

It's unlikely that the Spaniards, from their relatively low vantage point, could have seen the goats in their summer habitat above timberline. What's more, the word the Spanish used for elk—an animal they had never seen and for which they had no name—was cibolos, or "buffalo." It is not indicated which Spanish word was translated as "mountain goats." Who knows what animal they were actually looking at when they used the word? With no specific observations of wildlife and no specific dates, the Spanish account, says Schultz, is an unsupported generalization.

It is a weakness that taints most of the historical "evidence." The 1889 press expedition, for example—described by Schultz as made up of "ex-soldiers, Indian fighters, prospectors, and cowboys"—believed the sound of grouse drumming their wings was rumbling geysers. They mistook Mt. Carrie for Mt. Olympus, and their discovery of a four-foot-thick ledge of silver remains a mystery, since the metal is not found in the Olympics. The *Seattle Press* said simply, "One goat was seen by the party." Since the group spent several weeks in a homestead area, with chickens among the animals described, the goat could very well have been a domestic one.

Samuel Gilman died at age 36, before *National Geographic* accepted his account for publication. Edited without his consultation, it's possible that errors crept into it. At any rate, Gilman lacks the specificity of a naturalist—at one point he mentions "partridges," which do not exist on the peninsula.

If anything, the historical accounts are remarkable for the absence of goats. Some of the 19th century expeditions passed through what could have been prime goat habitat and turned up no evidence of the animal. At least three other pre-1925 reports on Olympic wildlife are emphatic about it. In 1898, biologists from Chicago's Field Museum spent three months on the peninsula, much of it in goat habitat. Their catalogue of wildlife does not include mountain goats, even though they searched for the animal's tracks, droppings, and swatches of hair.

Above: Animal aloft. The Park Service has tried many methods to capture and relocate the goats, from rope snares to net guns shot from helicopters.
RICHARD OLSON

To archeologist Paul Gleeson, this is one of the most telling things about the historical record. The people who were trained to observe and record wildlife—and who came for the purpose of doing so—do not mention goats. The animal is absent even in the accounts of trappers, outfitters, and hunters, many of whom, Gleeson says, "certainly would have hunted goat had it been available."

Hard evidence in the ground, of course, could make the case. But the archeological testimony is ambiguous, often offering more questions than answers.

Archeologist Randall Schalk says that of 24 peninsula sites that have yielded mammalian faunal remains, not one has turned up the bones of a mountain goat. Still, Schalk concludes that the archeofaunal record, taken alone, is not conclusive on either the presence or absence of the animal since late Pleistocene times. Even the biggest finds, he says, do not contain large numbers of land mammals, and the sites are far from possible goat habitats.

Yet, archeology—when examined in light of the historical and ethnographic evidence—is a critical part of the puzzle. Indeed, for one of the reviewers, Duke University's Harold K. Steen, the archeological proof is enough. "I am most influenced by Randall Schalk's work," he writes. "If goats had existed on the peninsula during the time period studied, a resource that valuable would have left abundant evidence."

Still, if bones had been found, would that be proof of the goats' existence? There is ample evidence of an extensive trade network among Indian tribes that brought goods from far away. The goat horn ladles found at the La Push archeological site—which are often put forth as evidence—could very well have been cherished items purchased at great expense from traders. The same goes for goat bones discovered at coastal sites.

Schalk adds that hunters of the animals in their high, rugged habitat may have employed "maximum processing" at the kill site, to avoid carrying heavy loads on the descent back to their villages. He also points out that the hunters would probably have been after the hides, and so would have left the skinned carcasses where they lay.

If this were true, the best place to look for

Historians, archeologists, and cultural anthropologists routinely gather and interpret data about past environments and the ways humans have altered or been affected by them. Without an understanding of human effects on the environment through time and the long-term natural cycles of change, decisions on how to manage an ecosystem can be subject to error.

Archeological data can tell us which plants and animals were present at a particular place and time; such data are available for North American cultures for the last 12,000 years. Resource managers rely on this information when planning future plant and animal conditions within a given ecosystem. Archeologists can also tell us ways in which earlier cultures interacted with their natural environment as well as the outcomes of their approaches to resource management; that kind of information may help us to evaluate the consequences of decisions today.

Data used to reconstruct prehistoric climates (paleoenvironments) are routinely gathered during archeological studies. For example, specialists study fossilized pollen found in buried archeological deposits and in preserved pack rat nests. Each species of plant has a unique pollen, so that the pollen record gives direct evidence about the plants, wild and cultivated, growing in a locality. Pack rats are environment "samplers"; they will gather pieces of most plants growing within 50 meters of their nest. Stored in the nests, and constantly covered with "amberrat" (the pack rat's thick urine), plant parts are preserved; in the arid West, pack rat nests protected in the cliffs and rocky overhangs can last thousands of years.

Other tools archeologists use to reconstruct past climates are tree-ring studies, soils analysis, and geomorphological analyses. Through these studies, information is gleaned on vegetation composition, soil conditions, and drought cycles, data helpful in distinguishing natural from human-induced environmental changes.

Historical records, such as old photographs, survey records and surveyors' notes, and oral histories are invaluable for understanding more recent impacts of humans on the environment. Surveyors' notes record vegetation and animal populations just prior to the period of rapid westward expansion, providing a detailed "snapshot" in time. Similarly, comparisons of photographs taken from the same vantage point decades apart document landscape changes.

Cultural anthropologists record how contemporary and historic Native American cultures have responded to and influenced their natural environments, and the traditional uses they have made of their natural resources and ecosystems. Among other things, such studies have "rediscovered" successful land management practices developed by these cultures over many millennia.

The archeological record shows us that some of our major contemporary ecosystem issues have a prehistoric parallel; consider the case of the Anasazi people.

Wood consumption was extensive in ancient villages; it was used as fuel for heat, cooking and firing ceramic vessels, and as construction material for structures. The roofs of some large structures required about 160 juniper logs to construct! Archelogists hypothesize that sometimes wood resources surrounding agricultural villages were sufficiently decimated as to make the area uninhabitable. What evidence could archeologists look for to test this hypothesis?

At the [Anasazi] Grass Mesa village site in southwestern Colorado, archaeologists found only one type of wood—juniper—at the level corresponding to the earliest human occupation in about 800 A.D. Population at that time is estimated to have been about 10 people. Over the next century, the population increased to 300, then dropped to 10 by the time the site was abandoned in about 925 A.D. Presumably, the earliest occupants could have chosen any local trees they wanted, and those species growing on the mesa would have been the easiest to harvest. At the level of the site representing the period of population growth, archeologists found wood from at least five species; at the time of the population peak, at least 10 tree species were being used. Cottonwood, an inferior construction material that had to be transported from the valley bottom to the site, began to be used for the first time.

In the face of a wood resource shortage, the prehistoric Anasazi had several choices:

To use less desirable wood species

To use less wood

To use wood from farther and farther away

To move the village to a new location.

Can you think of other alternatives? Today, in the face of our depleted forest resources, what choices do we have? How do our choices differ from the Anasazi's? The Grass Mesa residents chose to move their village. What can we learn from their experience?

From "Understanding Ecosystem Management," by Shelley Smith, Richard Brook, and Mary Tisdale, developed by the Bureau of Land Management for teachers of middle school children and published in Science and Children *magazine. For information on this and other BLM education initiatives, contact Mary Tisdale, BLM Volunteers in Education, LS-1275, 1849 C St., NW, Washington, D.C. 20240.*

evidence is at high elevations. Mountainous deposits, he says, "offer the greatest potential for providing data that are decisive."

To further muddy the picture, Schalk suggests that—unlike coastal sand, which generally preserves remains—the meager, acid soil above the timberline causes them to deteriorate rapidly. Conceivably, proof of the goat's presence could have just evaporated with time.

For comparison to the Olympic region, investigators examined the archeological record where mountain goats are indigenous, turning up an abundance of remains, even at coastal sites. "There was trade up and down the whole peninsula," says Gleeson. "You'd expect to see at least some on the shore. If there was goat . . . why didn't it show up at places like Ozette, where there is a large faunal assemblage?"

The visit by the Spanish in the summer of 1792 was just one of the frequent contacts among cultures along the coast. A witness wrote that the native canoeists meeting the European schooners in the Strait of Juan de Fuca were dressed in "no more than a cloak of rough wool and well woven, joined by two clasps at the shoulders." In one canoe was a man "who seemed to be the chief meriting special attention; he wore . . . a cloak of fine wool, a hat with an ornament like a shortened cone, five tin bracelets on the right wrist ."

Garments of woven wool, often called goat wool, appear commonly in descriptions of the region's native peoples, feeding explorers' assumptions that goats were an abundant resource. It may be, though, that the wool did not come from goats at all.

Top: Piper's bellflower, one of eight wildflowers found only on the peninsula; Above: The rare Olympic Mountain milkvetch. Both are threatened by goats.
OLYMPIC NATIONAL PARK

Ethnographic sources reveal that items made from goat wool were symbols of status. Described by Schalk as "prestige items for the wealthy," they were used in spirit dances, for mourning, for burials, and as bride-price payments. The Makah reserved the use of goat horn spoons for feasts. Goat wool was most likely not only prized for its scarcity, but also for the warmth it could provide in a cool marine environment.

But there was another, more common wool, which intrigued the Spanish because of its similarity to dog hair. "In their settlements," writes an observer, "There were a large number of these animals, most of which had been shorn. They . . . are similar to English-bred dogs, very long-haired and generally white; among other characteristics that distinguish them from those of Europe is their manner of barking, which is no more than a miserable yelping."

The Spanish were referring to the so-called "wool dogs," whose hair was a practical if inferior substitute for that of the mountain goat. In a 1927 study, an anthropologist noted that Northwest Coast tribes that kept wool dogs did not have mountain goats. According to Schalk, ethnographic data suggest that, likewise, tribes with goats did not keep wool dogs.

Wool dogs were kept in pens, in houses, even on islands, to prevent interbreeding between them and hunting dogs. At the Ozette site, where the Makah were known to have kept wool dogs, researchers believe there were two breeds, one a hunting dog and the other a wool dog. Eventually, the wool dog—described as having a long, pointed muzzle and a curled tail—is thought to have disappeared with the introduction of European trade blankets and by interbreeding with other kinds of dogs.

Viewing the evidence unearthed by the multi-disciplinary inquiry, the independent reviewers found a compelling picture. Their opinions are perhaps best summed up by Thomas R. Cox of San Diego State University: "Only one conclusion is possible: There were never mountain goats in the Olympics prior to 1925. Chances that [they] were present seem so remote as to be of negligible importance."

Lyman's hypothesis, though intriguing and given serious consideration, was judged to be conjectural and lacking evidence. The Fund for Animals, in protesting Park Service policy, is using historical information "selectively and uncritically," Gleeson says. Adds Schalk, "How far do you want to pursue an interesting idea that doesn't have any empirical basis?"

The National Park Service is charged with managing exotic plant and animal species, even if that includes eradication. Its 1991 Natural Resources Management Guidelines emphasize that "protection of native ecosystems represents one of the primary legal mandates of the National Park System." In the draft environmental impact statement, Olympic National Park superintendent David Morris wrote, "We do not present this document lightly, nor do we look forward to carrying out the preferred strategy." Though shooting is preferred, two other alternatives are being considered. One is "no action"; another is to capture as many goats as possible over a defined period and then shoot any that may be left. The draft is available for public comment until July 17.

The severity with which ecosystems respond to even the slightest interference is well known. Shockwaves are felt even in insect communities. Alpine and subalpine meadows—far more complex than forests—are sensitive to factors such as snow retention, temperature, moisture, and disturbance by both animals and people. Introducing herbivores like the goat has driven rare plants to extinction in similar environments.

In coaxing a story from the fragments of the past, the researchers on this project reconstructed an ecosystem in the interest of its future survival. But they did more than that. They demonstrated that life on earth, past and present, is expressed in the language of all the sciences.

Documents produced for the draft environmental impact statement were A Review of the Ethnographic and Archaeological Evidence Relating to Mountain Goats in the Olympic Mountains *by Randall F. Schalk of Infotec Research, Inc.;* A Review of the Historical Evidence Relating to Mountain Goats in the Olympic Mountains Prior to 1925 *by Susan Schultz, National Park Service; and* Extract from Draft Monograph Regarding Mountain Goats in Olympic National Park *by Douglas B. Houston and Edward G. Schreiner of the National Biological Service. To receive a copy of the statement, contact Olympic National Park, 600 East Park Ave., Port Angeles, WA 98362, (360)-452-0321. Also available at Park Service regional offices and major Washington State libraries.*

NAGPRA NEWS

Implementing the Native American Graves Protection and Repatriation Act

Field Museum Submits Inventory of Pawnee Remains

Chicago's Field Museum of Natural History has submitted an inventory of remains culturally affiliated with the Pawnee Tribe of Oklahoma. The inventory was accompanied by a letter of notification that was published in the *Federal Register*.

The notification's purpose is to summarize the inventory in enough detail that readers can ascertain if they are culturally affiliated with items in it. Other lineal descendants or culturally affiliated tribes have 30 days after publication to contact the museum about treatment and disposition of the remains.

In related news, the Andover, Massachusetts, Peabody Museum published a letter of notification after submitting an inventory of remains that had originated from the Titicut Site in Bridgewater, Massachusetts. As last issue reported, the review committee recommended that the museum repatriate to the Mashpee Wampanoag, who are not federally recognized.

This brings the total to 29 notices, which describe 1,199 remains and 475 associated funerary objects.

Video Link to the National Mall

Alaska's Tlingit and Haida tribes were guests recently on a special tour of Smithsonian collections. The unusual part of the tour, hosted by the Natural History Museum's repatriation office, was that the tribes didn't travel any farther than Juneau.

The tour, conducted via video hookup, is a test of how the technology can be applied in the future, says Chuck Smythe, an anthropologist with the repatriation office. Images of artifacts placed on a table in Washington (above) were beamed over the phone lines to a monitor in Juneau.

Two methods of transmission were tested. One, which needs several lines, allows for high resolution moving images. The other, which requires only one line, is restricted to stills. The latter method, say Smithsonian staffers, may be better for remote villages that only have a few lines.

The test was a way "to bring people together who wouldn't ordinarily get to the museum," says Smythe—and to find out if tribal elders would be comfortable with the technology.

Cheryl Eldemar, cultural resource specialist with the Tlingit and Haida's central council, expressed hope that the technology may one day help other tribes too.

Field and Fleming to Repatriate Objects

The Field Museum has published a notice of intent to repatriate two objects of cultural patrimony—the Little Elk Standing Village bundle and the Big Black Meteoritic Bundle—both culturally affiliated with the Pawnee Tribe of Oklahoma. Meanwhile, the Robert Hull Fleming Museum at the University of Vermont has published a notice of intent to repatriate a turtle shell rattle culturally affiliated with the Oneida Indian Nation of New York. The rattle was identified as a sacred object and an object of cultural patrimony.

Both notices appeared in the *Federal Register*, giving other lineal descendants or culturally affiliated tribes 30 days to contact the museum about the objects.

Nine notices have appeared in the *Register* since November, bringing the total to 20.

For More Information

Contact Timothy McKeown, NAGPRA Program Leader, Archeological Assistance Division, National Park Service, P.O. Box 37127, Washington, DC 20013-7127, (202) 343-4101, fax (202) 523-1547.

A National Niche

How a National Institute for the Environment Would Benefit Archeology

DON FOWLER AND CHARLES S. MCCARTHY

MORE AND MORE, we archeologists realize that our science is among those disciplines that should be considered relevant to the environmental challenges of today and tomorrow. We strive to understand, while at the same time helping other scientists understand, our niche in solving environmental problems. Recently, archeological conferences have focused solely or partly on developing the connections between archeology and environmental problem solving.

Archeology inhabits a unique position at the intersection of the physical and social sciences. Archeology is particularly suited to bridging historically non-collaborative disciplines. More importantly, we archeologists are in a position to offer a sense of human history and ecological context that is often missing from environmental research. We are all familiar with the quote, "Those who ignore the past are doomed to repeat it." As modern societies face the challenges of a changing environment—including desertification, deforestation, and pollution—it is important to learn from the successes and failures of past societies that faced similar challenges.

But environmental archeology faces the same problem as many other meta-disciplines. It is difficult to find funds, particularly for applied work. Traditional funding sources rarely support the use of archeology in environmental problem solving.

For these reasons and others we'll outline here, archeologists should be very interested in the National Institute for the Environment, a proposed new agency that would have the broad mission of improving the scientific basis for environmental decision-making.

THE INSTITUTE would accomplish this goal by integrating four important functions. The first is sponsorship of competitive, credible research on key long- and short-term environmental problems. Second, the institute would assess current environmental knowledge, identify deficiencies in it, and set priorities for research. Third, the institute would facilitate access to environmental information through a state-of-the-art electronic clearinghouse, the National Library for the Environment. Finally the institute would sponsor higher education and training with an emphasis on bridging disciplines.

By including all stakeholders in the process—policymakers, scientists, educators, business professionals, citizens—the institute would link good science to sound policy, a connection often missing today. With its role mainly that of a granting body, the institute would produce high quality information unaffected by any regulatory or management agenda.

BUT, PERHAPS OF MOST RELEVANCE to archeology, the National Institute for the Environment also would straddle the rift between the social and physical sciences, emphasizing not only multidisciplinary, but interdisciplinary, research projects—increasing funding as well as visibility for archeology in the environmental arena.

For more information, contact the Committee for the National Institute for the Environment, 730 11th St., NW, Washington, DC 20001, (202) 628-4303, Internet U24223@uicvm.uic.edu.

Don Fowler is the Mamie Kleberg Professor of Anthropology at the University of Nevada, Reno. Charles McCarthy is an intern with the Committee for the National Institute for the Environment and a graduating senior at the University of Illinois, Chicago.

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